

nois. At Detroit it was noticed that the snow flakes were of enormous size, the diameter being little smaller than a silver dollar; the air was warm and the snow soon turned to rain. A gust of wind moving in a narrow path passed over the island 2 miles north of Hatteras, N. C., at 8.50 p. m. Minor damage was done. Heavy gales and snow prevailed over the Great Lakes and the upper Mississippi valley. At nearly all the Lake stations the storm continued during the 22d. All vessels remained in port and a number of out vessels were over due. The steamer "Arabia" arrived at Bayfield, Wis., on the 22d and reported the storm on Lake Superior the worst in years. The wind blew a furious gale, driving a dense fall of snow before it. At Grand Haven, Mich., snow began at 11 a. m., 21st, and continued until the 23d. The wind increased to high at 7 p. m., 21st, with heavy squalls, and the gale continued throughout the greater portion of the 22d; a heavy sea was running. A schooner was caught in the storm and damaged, and another small schooner was beached 5 miles from port.

24th.—A heavy thunderstorm passed east and south of Eureka, Cal. Considerable damage was done to the jetty work at the mouth of Humboldt Bay. Damage was also done to electric wires.

26th.—A severe storm (possibly a tornado) passed over Port Eads, La., and vicinity. With one exception every house on both sides of the river was flooded. Damage was done to outhouses and fences; the water rose two feet higher than ever before.

27th.—At Paterson, N. J., a heavy windstorm blew down fences and trees. A heavy thunder, wind, and rain storm passed over Pensacola, Fla., in the early morning. The wind reached a maximum velocity of 56 miles per hour. A house was struck by lightning; several vessels dragged their anchors, and a large amount of timber was cast adrift in the bay.

28th.—At Boston, Mass., rain began in the early morning and ended 10 a. m., attended by high wind, reaching a maximum velocity of 39 miles per hour. Considerable damage was done to shipping by high wind and heavy seas. A schooner reported foundered off Dread Ledge, Swampscott. At Egg Rock, off Nahant, Mass., a southeast gale, with heavy rain, prevailed. A vessel was sunk about three-fourths of a mile from station and all persons on board were drowned. A report from Eureka, Cal., states that heavy rains prevailed along the Mad and Eel rivers and damage was done by flood.

29th.—A severe windstorm at South Fork, Ky., blew down timber and fences.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS.

The following table shows the danger-points at the various river stations; the highest and lowest stages for the month, with the dates of occurrence; and the monthly ranges:

Heights of rivers above low-water mark, November, 1898.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Red River.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>
Shreveport, La.	29.2	—1.0	30	—2.5	17-21	1.5
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	6.4	30	0.0	23-25	6.4
Little Rock, Ark.	23.0	7.4	30	2.9	11, 20	4.5
<i>Missouri River.</i>						
Fort Buford, N. Dak.*	25.0	8.0	25	5.9	23	2.1
Bismarck, N. Dak.	75.0					
Pierre, S. Dak.	13.0					
Sioux City, Iowa†	18.7	6.6	15	6.0	10, 20-23	0.6
Omaha, Nebr.	18.0					
Kansas City, Mo.	21.0	6.3	21, 22	4.8	30	1.5
<i>Mississippi River.</i>						
Saint Paul, Minn.	14.0	3.0	1, 2	0.6	26	2.4
La Crosse, Wis.	10.0	2.7	28-30	1.6	25	1.1
Dubuque, Iowa‡	16.0	2.7	1	0.9	29, 30	1.8
Davenport, Iowa	15.0	1.6	1-5	0.0	28-30	1.6
Keokuk, Iowa	14.0	1.4	2, 3	—1.9	27, 30	3.3
Hannibal, Mo.	17.0	1.9	1-4	0.3	28-30	1.6
Saint Louis, Mo.	30.0	3.4	6	2.5	30	0.9
Cairo, Ill.	40.0	7.6	2-4	5.3	30	2.3
Memphis, Tenn.	33.0	4.6	1	3.0	29, 30	1.6
Vicksburg, Miss.	41.0	3.6	3	0.4	19, 20	3.2
New Orleans, La.	13.0	4.2	27, 28	2.9	9	1.3
<i>Ohio River.</i>						
Parkersburg, W. Va.	38.0	7.3	10	2.8	19, 21	4.5
Cincinnati, Ohio	45.0	13.8	8, 9	6.4	27	7.4
Louisville, Ky.	24.0	6.9	10, 11	4.0	26, 27	2.9
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	3.3	29, 30	0.6	2, 3	2.7
<i>Tennessee River.</i>						
Chattanooga, Tenn.	33.0	4.8	12	2.3	9	2.5
Knoxville, Tenn.	29.0					
<i>Monongahela River.</i>						
Pittsburg, Pa.	22.0	8.0	7	5.3	16	2.7
<i>Savannah River.</i>						
Augusta, Ga.	32.6	8.2	30	5.7	3	2.5
<i>Willamette River.</i>						
Portland, Oregon	15.0	14.0	30	2.0	2, 3	12.0
<i>Susquehanna River.</i>						
Harrisburg, Pa.	17.0	3.7	30	1.6	22, 23, 26, 27	2.1
<i>Alabama River.</i>						
Montgomery, Ala.	48.0	2.2	29	0.1	1-3	2.1
<i>James River.</i>						
Lynchburg, Va.	18.0	3.4	29	0.8	26, 27	2.6
<i>Sacramento River.</i>						
Red Bluff, Cal.	22.0					
Sacramento, Cal.	25.0	18.3	29	7.5	5, 6	10.6
<i>Des Moines River.</i>						
Des Moines, Iowa§	19.0	3.1	1	2.9	3-17, 19	0.2

* For 25 days.

† For 23 days.

‡ For 26 days.

§ For 20 days.

FLOODS.

The above table shows that during the month of November the only rivers that experienced special high waters were the Willamette River at Portland, Oregon, on the 30th, and the Sacramento River at Sacramento, Cal., on the 29th. The following additional report has been received:

The Columbia rose 6 feet between the 3d and 12th at The Dalles, Oregon, and an erroneous newspaper report of a rise of 6 feet in 12 hours should be corrected accordingly.

CLOSING OF NAVIGATION.

The dates of closing of navigation by ice in rivers and harbors are reported as follows:

Black River.—Port Huron, Mich., thin floating ice 24th; frozen over 25th.

Delaware River.—Trenton, N. J., canal frozen 26th.

Grand River.—Lansing, Mich., closed 23d.

Hudson River.—Albany, N. Y., ice on river 26th; ice floating down 27th.

Illinois River.—Beardstown, Ill., frozen 23d.

Manitowoc River.—Manitowoc, Wis., closed 14th.

Minnesota River.—Belle Plaine, Minn., covered with thin ice 20th.

Mississippi River.—Saint Cloud, Minn., river frozen 18th. Saint Paul, Minn., thin floating ice 23d; gorged, and frozen above the bridge, 24th; frozen, except at the foot of Jackson street, 30th. Hastings, Minn., closed 18th. Red Wing, Minn., frozen 24th. Winona, Minn., frozen 29th. North McGregor, Iowa, gorged 24th. Dubuque, Iowa, frozen up 24th and navigation closed; river ice broke up 28th. La Crosse, Wis., much floating ice 19th to 23d; frozen below, 28th; frozen above, 30th; Black River frozen up 25th. Burlington, Iowa, frozen over and closed 24th, earlier than for many years. Le Claire, Iowa, running ice 22d; frozen up 23d. Muscatine, Iowa, floating ice 23d. Davenport, Iowa, floating ice 23d; full of ice 24th to 26th; frozen along shore 27th to 30th. Warsaw, Ill., full of floating ice 23d. Keokuk, Iowa, running ice 23d and 30th.

Missouri River.—Bismarck, N. Dak., river closed 23d. Sioux City, Iowa, running ice 15th; much floating ice 17th to 20th and 22d to 30th; river channel nearly closed 24th; river gauge frozen up. Plattsmouth, Nebr., floating ice 15th.

Thunderstorms and auroras, November, 1898.

States.	No. of stations.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Total.			
Alabama	53	T. A.	1																								1	2					4	T. A.		
Arizona	49	T. A.																	1		1					1							3	T. A.		
Arkansas	43	T. A.			3				1													1						3					8	T. A.		
California	299	T. A.																2							10	2							14	T. A.		
Colorado	77	T. A.																1			1												1	T. A.		
Connecticut	25	T. A.																																9	T. A.	
Delaware	5	T. A.	7	1	1																													9	T. A.	
District of Columbia ..	4	T. A.	1					1																										3	T. A.	
Florida	35	T. A.							1																									30	T. A.	
Georgia	64	T. A.																																3	T. A.	
Idaho	12	T. A.																																2	T. A.	
Illinois	53	T. A.	7	1	2																													10	T. A.	
Indiana	40	T. A.																																1	T. A.	
Indian Territory	6	T. A.	3		1																	1												3	T. A.	
Iowa	75	T. A.	2	1																														3	T. A.	
Kansas	71	T. A.	2	1	2																													3	T. A.	
Kentucky	35	T. A.			2	1																												6	T. A.	
Louisiana	47	T. A.				2				3										1	1	8	2				4	15	5	1			42	T. A.		
Maine	19	T. A.																																20	T. A.	
Maryland	26	T. A.	5		4		1	4	3	1																								13	T. A.	
Massachusetts	82	T. A.	12		1																													1	T. A.	
Michigan	68	T. A.	15	3	2				1	1		1																						24	T. A.	
Minnesota	70	T. A.	14	3	2																													19	T. A.	
Mississippi	41	T. A.	11	4	6				1																									22	T. A.	
Missouri	95	T. A.				1				1																								3	T. A.	
Montana	18	T. A.	2	1																														4	T. A.	
Nebraska	74	T. A.	3																															6	T. A.	
Nevada	45	T. A.	4	1																														5	T. A.	
New Hampshire	29	T. A.																																1	T. A.	
New Jersey	56	T. A.	6	1	3		1	1	1									1																15	T. A.	
New Mexico	20	T. A.	15	3				1	1		1																							21	T. A.	
New York	79	T. A.		4																														4	T. A.	
North Carolina	52	T. A.	4						1	1																								5	T. A.	
North Dakota	35	T. A.		1																														2	T. A.	
Ohio	130	T. A.	1	10	1																													20	T. A.	
Oklahoma	9	T. A.	10	2					1																									14	T. A.	
Oregon	60	T. A.																																	1	T. A.
Pennsylvania	78	T. A.		1																														2	T. A.	
Rhode Island	9	T. A.	2																															2	T. A.	
South Carolina	49	T. A.	1																															1	T. A.	
South Dakota	44	T. A.																																2	T. A.	
Tennessee	43	T. A.	3	2		1																1												7	T. A.	
Texas	77	T. A.				1	1			2	5			1	3	2	1				1	2	5					2	13					35	T. A.	
Utah	33	T. A.																																0	T. A.	
Vermont	14	T. A.																																1	T. A.	
Virginia	35	T. A.	2	1	3																													6	T. A.	
Washington	41	T. A.	2																															2	T. A.	
West Virginia	32	T. A.	2																															3	T. A.	
Wisconsin	55	T. A.	1	2																														3	T. A.	
Wyoming	12	T. A.	14	6	1				1																									22	T. A.	
Sums	2,505	T. A.	13	22	15	5	1	0	5	15	1	0	1	3	2	0	0	1	3	3	3	19	7	3	8	12	9	33	29	1	16	0	233	T. A.		
		A.	147	32	26	5	2	9	8	2	2	2	2	0	0	0	1	1	0	0	2	1	0	1	1	1	3	3	3	1	1	2	248	A.		

NOTE.—Correction to October table: add 1 aurora, observed on the 2d at Greenfield Hill, Conn., to the total for that state.

Lynch, Nebr., navigation closed 22d. Yankton, S. Dak., running ice 22d; full of ice 23d; river closed 24th. Saint Joseph, Mo., slush ice in river 23d to 28th. Kansas City, Mo., much floating ice 24th.

Monongahela River.—Lock No. 4, Pa., frozen 26th; Pittsburgh, Pa., frozen 26th.

Red River.—Saint Vincent, Minn., frozen, and ferry discontinued, 18th.

Ohio River.—Wheeling, W. Va., floating ice 26th and 27th.

Saint Croix River.—Osceola Mills, Wis., frozen 25th.

Susquehanna River.—Harrisburg, Pa., slush ice 25th.

Lock Haven, Pa., thin ice 17th; clear 22d; frozen up 25th; clear 30th.

Wabash River.—Lafayette, Ind., frozen 24th.

Wisconsin River.—Stevens Point, Wis., frozen 15th.

Lake Erie.—Sandusky, Ohio, bay frozen 25th. Toledo, Ohio, ice in river 24th; river and bay frozen over and navigation hindered 25th; river free from ice 27th.

Lake Michigan.—Chicago, Ill., harbor frozen 25th.

Lake Minnetonka.—Minneapolis, Minn., frozen over 24th, the earliest date of freezing ever known.

Lake Pepin.—Lake Pepin, Wis., frozen 23d.

ATMOSPHERIC ELECTRICITY.

THUNDERSTORMS AND AURORAS.

The table on p. 327 shows in detail for November, 1893, (1) the number of stations from which meteorological reports were received; (2) the number of such stations reporting thunderstorms (T) and auroras (A), respectively, in each state and on each day of the month on which the phenomena were observed.

THUNDERSTORMS.

Description of the more severe thunderstorms reported for the month is given under "Local storms."

The dates on which reports were most numerous are the 1st, 2d, 3d, 15th, 20th, 24th, 26th, 27th, and 29th.

The dates on which they were least numerous are the 5th, 6th, 9th, 10th, 11th, 14th, 15th, 28th, and 30th.

The states from which the most numerous thunderstorm reports were received were Florida, 30; Louisiana, 42; Texas, 35.

AURORAS.

The evenings on which the full moonlight must have interfered with ordinary observations were the 20th to 28th, inclusive; on the remaining 21 evenings 240 observations of auroras are reported, or an average of 11 daily; the dates on which the reported number exceeded this average are the 1st, 2d, and 3d. During these three evenings an extensive auroral display occurred, and observations are at hand from the following states on one or more of these dates: Connecticut, Delaware, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, Rhode Island, South Dakota, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

The following table gives an abstract of auroral observations made on the evening of the 1st and morning of the 2d:

Auroral display of November 1st.

Date.	Station.	Extent of display.		Remarks.
		Azimuth.	Altitude.	
		°	°	
1	Eastport, Me.		30	Waves of light shooting from w. to e. and extending to zenith.
1	Boston, Mass.		60	Glow changing to red and yellow.
1	Woods Holl, Mass.	110 to 250	20	Diffused white light.
1	New Haven, Conn.	145 to 215	30 to 90	Pale green color. Streamers at intervals nearly to zenith.
1	New London, Conn.	140 to 240	45 to 90	A diffused glow, resembling the dawn. About 12 streamers reaching an altitude of 55°.
1-2	Toms River, N. J.	135 to 225	90	Long narrow strips of pink, red, and white shot up to zenith.
1	Alpena, Mich.	90 to 270	35	Band of white light, with beams of pale straw color moving rapidly back and forth.
1	Boon, Mich.			Arch; beams of yellow light appearing and disappearing rapidly, a motion from w. to e.
1	Marquette, Mich.	225	90	Luminous patches; streamers to 20° s. of zenith.
1-2	Sault Ste. Marie, Mich.	135 to 270	40 to 90	Tea-green color. Waves of light moving from w. to e.
1	Minneapolis, Minn.	180 to 225	90	Streamers of white and rose-color nearly to zenith.
1-2	Bismarck, N. Dak.	110 to 250	40	Pale, diffused light, lasted until 2 a. m.
1	Rapid City, S. Dak.		50	Beams resting on a dark segment.
1-2	Havre, Mont.		10 to 45	Arch, with luminous beams to 30°. Bright flashes to zenith, moving with great rapidity, and having a rolling motion. At 1.20 a. m. flashes to 60° s. of zenith.
1	Miles City, Mont.			Diffused light; later an arch with bright flashes.
1	Rosalie, Wash.	150 to 240	25	Display resembling a hazy light, resting on a dark segment. A few small streamers in n. at 6.10 p. m.

EARTH CURRENTS AND MAGNETIC STORMS.

Notwithstanding the extensive distribution of the aurora of November 1st no account has come to hand of any important disturbance of electric telegraph work, whence we must infer that the ground currents during this aurora were feeble in North America.

STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts and summaries are republished from reports for November, 1893, of the directors of the various state weather services:

ALABAMA.

Temperature.—The mean was 0.8 above the normal; maximum, 86, at Maple Grove, 4th; minimum, 15, at Chepultepec and Decatur, 25th.

Precipitation.—The average was below the normal; greatest monthly, 5.14, at Thomasville; least monthly, 0.73, at Fort Deposit.

Wind.—Prevailing direction, north.—F. P. Chaffee, Local Forecast Office, Weather Bureau, Montgomery, director.

ARIZONA.

Temperature.—The mean was 3.0 below the normal; maximum, 89, at Buckeye, 1st; minimum, 11, at Flagstaff, 20th; greatest monthly range, 64, at Crittenden; least monthly range, 40, at Peoria.

Precipitation.—The average was 0.20 below the normal; greatest monthly, 1.87, at Payson; least monthly, 0.00, at Teviston.

Wind.—Prevailing direction, southwest.—W. Burrows, Observer, Weather Bureau, Tucson, director.

ARKANSAS.

Temperature.—The mean was 1.0 below the normal; maximum, 82, at Camden, 28d, and at Corning, 22d; minimum, 5, at Winslow, 4th; greatest monthly range, 74, at Keesees Ferry; least monthly range, 48, at Prescott.

Precipitation.—The average was 1.43 below the normal; greatest monthly, 5.71, at Madding; least monthly, 2.03, at Gaines Landing.

Wind.—Prevailing direction, south.—F. H. Clarke, Local Forecast Office.